

PATENT SPECIFICATION

NO DRAWINGS

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1.179.398

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Date of Application and filing Complete Specification: 26 June, 1967.

No. 29348/67.

Complete Specification Published: 28 Jan., 1970.

Index at acceptance: —C3 P(14D8, 14K7, 14K8, 14P4C, 14P5, 14P6H, 14P6X)

International Classification: —C 08 f 11/02

COMPLETE SPECIFICATION

Improvements in or relating to Printed Circuit Boards

We, FORD MOTOR COMPANY, a Corporation organized and existing under the Laws of the State of Delaware, United States of America, of Dearborn, Michigan, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a process for the preparation of printed circuit boards of the type conventionally employed in electrical and electronic apparatus. These circuit boards usually consist of a central insulating layer of polymeric material coated on either or both sides with a sheet of copper for conducting purposes. The detailed circuits on the surface of these printed circuit boards are normally produced by coating the portions of the copper conducting sheet which are to remain with a so-called "ink resist" and then chemically or electro-chemically etching away the unprotected copper.

The circuit board now has the desired circuits outlined in copper or other conductive metals. The circuit components such as capacitors, resistors and like elements are normally secured to the copper circuit by soldering. To accomplish this operation the portions of the copper circuit not immediately adjacent the lead from the component to be added must be protected from the action of the molten solder. This protection is obtained by the coating of the copper not to be soldered with a "solder resist". This "solder resist" need only be sufficiently durable to protect the copper from the molten solder for the very few seconds required for the

soldering operation. This invention is specifically concerned with a process of preparing the "solder resist" employed for protecting the copper circuits.

This "solder resist" normally comprises a liquid material polymerizable in an electron beam to which is added a filler and pigment. The adherence of these materials to either the polymeric circuit board surface or to the copper surface is decidedly improved by the addition to the liquid polymerizable coating material of acrylic acid or any of the well-known substituted acrylic acids. The preferred acid for this purpose is methacrylic acid. The process of the invention comprises applying to the surface of a polymeric board and/or to the surface of a copper circuit therein a coating comprising a liquid polymerizable by the action of an electron beam, a filler and an acid selected from acrylic acid and substituted acrylic acids, and curing the coating by subjecting it to the action of an electron beam. The chemistry of preferred examples of the "solder resists" is summarized in the table below:

	For Polymeric Surface (Vehicle)	
	wt %	
Unsaturated polyester	48.6	
Styrene	10.7	
Methyl Methacrylate	20.0	70
Methacrylic acid	20.7	
	(Filler)	
	wt %	
Pigment	95.4	
Cab-O-Sil	4.6	75

[Price 5s. 0d.]

		For Copper Surface (Vehicle)		comprising applying to the surface of a poly- meric board and/or to the surface of a copper circuit thereon a coating comprising a liquid polymerizable by the action of an electron beam, a filler and an acid selected from acrylic acid and substituted acrylic acids, and curing the coating by subjecting it to the action of an electron beam.	40
5	Unsaturated polyester	56.9			
	Styrene	12.5			
	Methyl Methacrylate	20.2			
	Methacrylic acid	10.4			
		(Filler)		2. A process as claimed in claim 1, in which the acid employed is methacrylic acid.	45
		wt %			
10	Pigment	75.0		3. A process as claimed in claim 1 or 2, in which the coating is applied directly to the polymeric board and in which the con- centration of acid in the polymerizable coat- ing is about twenty percent of the total weight of the liquid portion of the polymer- izable coating.	50
	Cab-O-Sil	25.0			
	The "solder resist" for application to the polymeric surface comprised 58.4% vehicle and 41.6% filler. Similarly, the "solder resist" designed for application to the copper surface comprised 85.1% vehicle and 14.9% filler.				
15	These "solder resists" are applied to the circuit board and are cured in situ by sub- jecting them to an electron beam. Actual boards have been produced by subjecting coated surfaces to a total electron energy dosage of 12 to 14 MRADS employing a current of 15 mils at 300,000 volts. Where the "solder resist" is applied directly to the polymeric board, it suitably contains about 20% by weight, based on the total weight of liquid, of the acrylic or substituted acrylic acid. Where the "solder resist" is applied to the surface of the copper circuit, it suitably contains about 10% by weight, based on the total weight of liquid, of the acrylic or sub- stituted acrylic acid.				55
20					
25					
30					
35	WHAT WE CLAIM IS:—				
	1. A process of producing a circuit board				
	comprising applying to the surface of a poly- meric board and/or to the surface of a copper circuit thereon a coating comprising a liquid polymerizable by the action of an electron beam, a filler and an acid selected from acrylic acid and substituted acrylic acids, and curing the coating by subjecting it to the action of an electron beam.				60
	2. A process as claimed in claim 1, in which the acid employed is methacrylic acid.				65
	3. A process as claimed in claim 1 or 2, in which the coating is applied directly to the polymeric board and in which the con- centration of acid in the polymerizable coat- ing is about twenty percent of the total weight of the liquid portion of the polymer- izable coating.				
	4. A process as claimed in claim 1 or 2, in which the coating is applied to the copper portion of the circuit board and in which the concentration of acid in the liquid in the polymerizable coating is about ten percent of the total weight of the liquid portion of the polymerizable coating.				
	5. A process as claimed in any of claims 1 to 4, in which the coating is polymerized by an electron dosage of 12 to 14 MRAD applied by a current of 15 mils at a poten- tial of 300,000 volts.				
	6. A process of producing a circuit board substantially as hereinbefore described with reference to the table given.				
	7. A printed circuit board when made by a process as claimed in any of claims 1 to 6.				
	MARKS & CLERK, Agents for the Applicants.				

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1970.
Published by the Patent Office, 25, Southampton Buildings, London W.C.2, from which copies may be obtained.